MAN.HESDMWD170 Release 0.2

SDMWD170v _ _ _ _

STEP MOTOR's
BASIC DRIVE MODULE

USER'S MANUAL

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Printed in LODI - ITALY 24/02/2003

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User Notes :

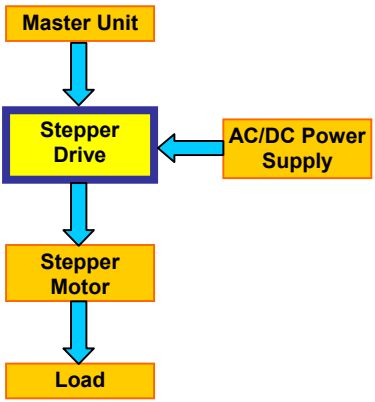
1 INTRODUCTION

This section introduces the main characteristics of the SDMWD170Vxxxx drive as a part of a step motor driving system.

1.1 Driving system parts

Parts to provide a stepper with for motion system completion

Block diagram



Motion system design steps:

1. Driving requirements definition (load torque, RPM, positioning precision, acceleration an d speed ratings, etc.);
2. Motor selection according to the previous step ratings;
3. Drive characteristics selection to meet:
    a. Motor power ratings
    b. Motion control commands mastering (Step / direction, serial communication links, etc.)
    c. Additional features (User I/O, encoder interface, etc.)
4. DC power supply sizing according to motion profile, motor power, drive supply ratings;
5. Drive heat dissipation capability provision;

Sizing tools Refer to support@everelettronica.it service for system parts sizing (motor, drive and power supply).

Refer to section A.2 for optional cooling devices.
Refer to section A.2 for power supply sizing information.

1.2 SDMWD170 description

The SDMWD170 has been designed to drive a step motor in 2 phases on bipolar chopper mode through step/direction inputs. The basic drive is compliant with the EN61800-3 and 60204-1 standards. The additional steps user must take to ensure a complete compliance are: earth connection of drive and motor, proper installation, ac mains filter, EMC compliant cabling of motor and drive.

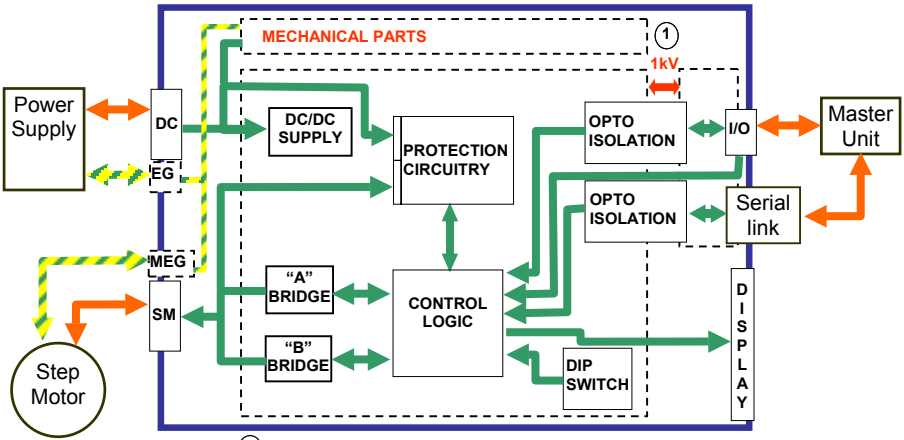
1.3 Basic Drive block diagram

The figure in the following shows the block diagram of a SDMWD170Vxxxx unit: a step & direction controlled device that can drive a two-phase motor in the bipolar chopper mode. The motor can have 4, 6 or 8 leads as well.
Thanks to the output stages voltage and current ratings, a wide range of motors can be driven by the drive.

Motor** features must be **compatible with** the output ratings of the **drive.

The drive is provided with:

- Micro-stepping for high resolution and smooth stepper operation;
- Winding current waveforms sinusoidal shaping to optimize motor performances;
- Over/Under voltage, Thermal and Over Current protections, with monitoring, to prevent the electronics from damaging.
- Motor steps ramps generation capability



(1) Max electric strength voltages between drive's parts

This manual contains mainly information and procedures to install, set-up and troubleshoot the unit. Several functions of the device depend on the version of the same.

1.4 Drive use limits, risks and warnings

- The planning of the installation must be compliant with the prescriptions in this manual.
- EVER ELETTRONICA is in no way responsible for damages to persons or to things caused by an improper use of the equipment.
- The system is actually an internal part of switchboard: it is responsibility of the planner of the SDMWD170 installation to meet a proper working environment providing at least the essential duty of the current standard.
- This manual is only for the planner of the SDLWD170 installation and not like support documentation for user.

The installation of the unit as well as of the accessories is only permissible by qualified personnel. A safe and trouble-free operation is only possible when the valid regulations according to EN 60204-1, EN61800-3 as well as the relevant regulations for end user's area are observed.

The opening of the drive's external enclosure is forbidden: inside it there are parts at high temperature. After any working section, wait some minutes before operating on the device so that the temperature of heat sink and the capacitors voltage go down to not dangerous values. Pay attention to the DC supply and motor cables connections: when the motor connector is unplugged and the SDMWD170 is powered dangerous voltages can be present on motor connector pins.

Making high pot tests on a machine including the SDMWD170 drive, be sure not to exceed the maximum insulation ratings of the unit.

The unit can cause surrounding pollution if removal standard requirements are not met at casting off.

1.5 Warranty

Ever Electronica warrants its motors and controllers to the original purchaser (end users, original equipment manufacturers or distributors), to be free from defects in material and workmanship and to be made in accordance with customer's specifications which have been accepted in writing with Ever.
Ever Elettronica's products are warranted for one year from date of manufacture as determined by the date code on the drive label.
In no event, however, shall EVER be liable or have any responsibility under such warranty if the product has been improperly stored, installed, used or maintained, or if the customer allows any unauthorized modifications, adjustment and/or repairs to such product.
EVER's obligation hereunder is limited solely to repairing (or replacing at its option), at its factory any product, or parts, which prove to EVER's satisfaction to be defective as a result of defective materials or workmanship, in accordance whit EVER's stated warranty.

The contents of this manual are believed to be correct at the time of printing. To allow continuous development and improvement of manufactures, EVER co. reserves the right to change the specifications, characteristics and performances of the product and the contents of this manual without notice.

EVER co. does not recommend the use of its products in life support applications wherein a failure or malfunction of the products may directly threaten life or injury. The user of EVER co. products in life support applications assumes all risks of such use and indemnifies EVER co. against all damages.

1.6 In this manual

The icons used in this Manual have the following meanings:

Danger
Warning
Caution

Used when life or health of the user are exposed to **danger or** when **severe damage** to materials can occur.

Attention

Special instruction for a safe and trouble-free operation.

Tip
Help
Information

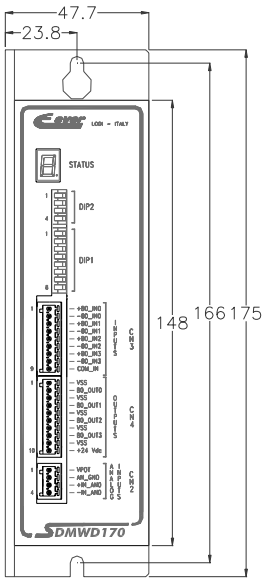
Used to mark **additional important information.**

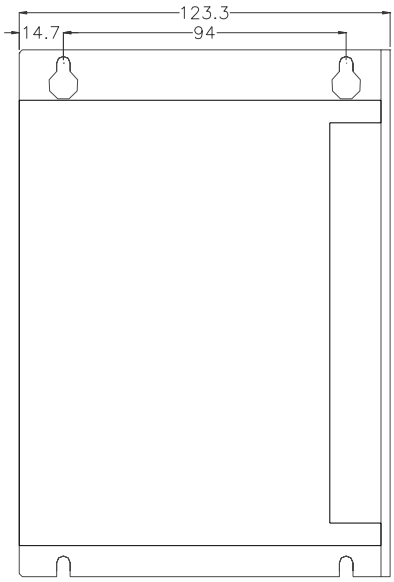
An essential element to meet the limit **values specified in the EMC directives** is, apart from the use of filters and chokes, the installation of the device following the EMC standards requirements.

2 Specifications

2.1 Mechanical

Dimensions Unit: mm





"A" mounting style "B" mounting style

As drive mounting parts the user must be provided with:

- #2 or #4 MA4 screws for unit A or B mounting style;
- #1 5-pins 721-605/000-042 WAGO 5mm pitch setting male connector for motor connection;
- #1 4-pins 721-104/026-045 WAGO 5mm pitch setting female connector for power supply and earth ground connection;
- #1 9-pins 1881396 PHOENIX MICRO-COMBICON 2.5mm pitch setting female connector for Digital Inputs connection;
- #1 10-pins 11881406 PHOENIX MICRO-COMBICON 2.5mm pitch setting female connector for Digital Outputs connection;
- #1 4-pins 1881341 PHOENIX MICRO-COMBICON 2.5mm pitch setting female connector for Digital Outputs connection;
- #1 SubD 9-pins female connector for serial link
- Dimensions 175(H) x 47.7(W) x 124(D) mm
- Weight 1500 g
- Protection class IP 20
- Storage temperature from - 25° C to +55° C
- Operating ambient temperature from 5 to 50° C
- Humidity 5% to 85% not condensing
- Maximum working altitude 1000 m.

2.2 Electrical

*The **electrical specifications** tolerances, when not differently indicated, **are according** to EN 60204 standard requirements.*
Some ratings depend on the actual drive version.

2.2.1 Power supply ratings

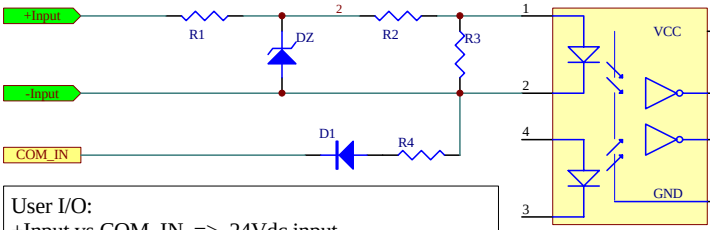
Refer to **section 5.0** *for the electrical specifications and **voltage ratings of power supply** of the actual **drive version.***

2.2.2 I/O electrical specifications

Digital Inputs can be used as real time, opto-isolated, 200kHz, 5Vdc line driver and 24Vdc PNP/Push-Pull type.

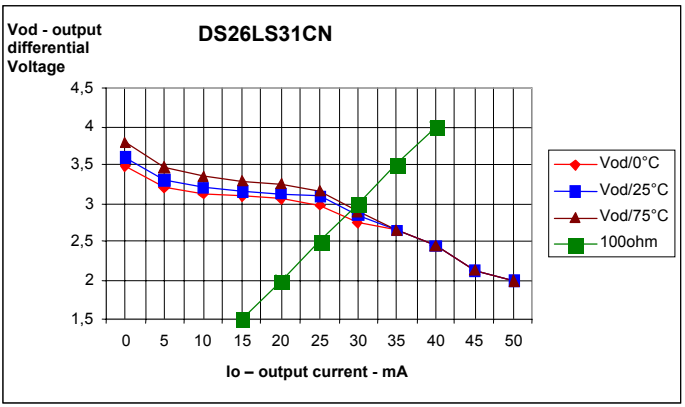
Digtal inputs cannot work at the same time as 5Vdc or 24Vdc

Digital Inputs Schematic



User I/O:
+Input vs COM_IN => 24Vdc input
+Input vs -Input => 5Vdc Line-Driver

Ratings The line driver inputs are designed to be driven through devices having the following V-A output characteristic.



To prevent input circuitry from improper functioning and damaging do not exceed the inputs maximum ratings listed in the following table.

Digital Input					
Rated Voltage	**Limits**	**State 0**		**State 1**	
		UL V	**IL mA**	**UH V**	**IH mA**
5 Vdc ± 5%	**Max.**	1.5	ND	5	17
	Min.	0	ND	2	3
24 Vdc ± 20%	**Max.**	ND	ND	19.2	7
	Min.	ND	ND	28.8	12
f_{MAX}		200kHz			
Protection		Against wrong control voltage polarity			

The devices connected to the drive inputs must be powered through a dedicated power supply.

Inputs Electrical Driving Guidelines

Inputs controlling devices with an output voltage Vo (Volt) exceeding the Line Driver's ratings must be connected to the basic drive inputs through a series resistor **Rs** rated the following way (Vo is assumed greater than 10 Vdc):

$R_S = [Vo * 125 – 220]\ \Omega$ with a power rating

$P_D = [(Vo / (R_S + 220))^2 * R_S]\ W$

For instance:

Assuming Vcc = 24Vdc ± 15%

$R_S = (24 * 125) - 220 \approx 2780\ \Omega$

$P_D = (24 / (2700 + 220))^2 * 2700 \approx 0.18W$ (0.25W @ Vo+15%)

A 2.7kΩ - ½ W rated external series resistor can be a proper choice.

Assuming Vcc = 12Vdc ± 15%

$R_S = (12 * 125) - 220 \approx 1280\ \Omega$

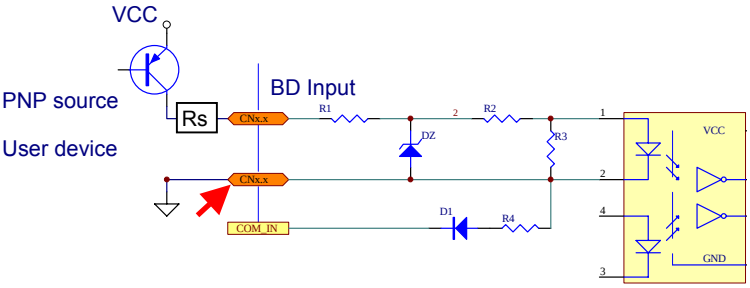
$P_D = (12 / (1200 + 220))^2 * 1200 \approx 0.086W$ (0.12W @ Vo+15%)

A 1.2kΩ - ½ W rated external series resistor can be an effective choice

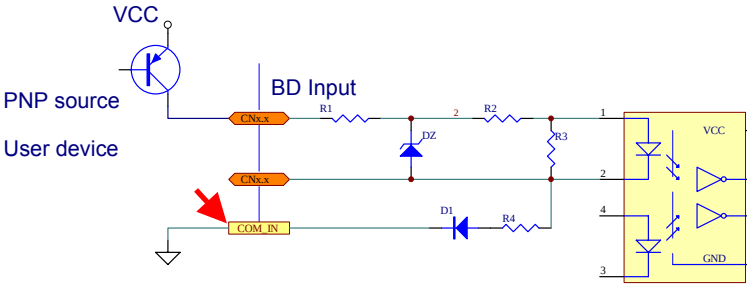
Connection guidelines versus input driving device output style.

PNP source

VCC = 5 Vdc

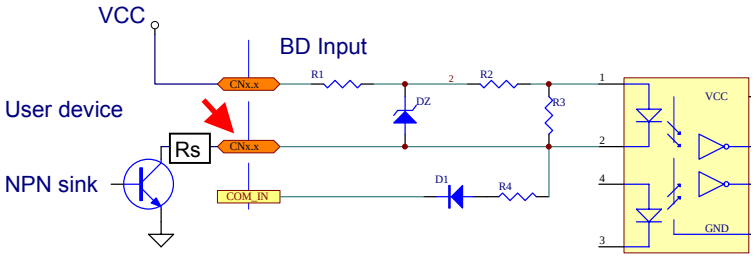


VCC = 24 Vdc



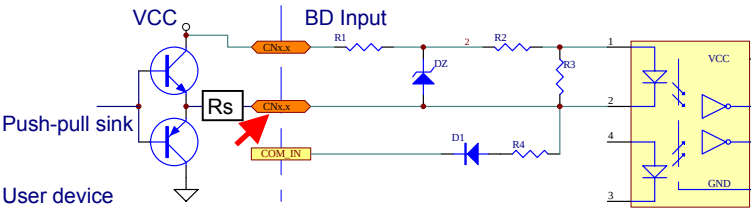
NPN sink

VCC = 5 Vdc



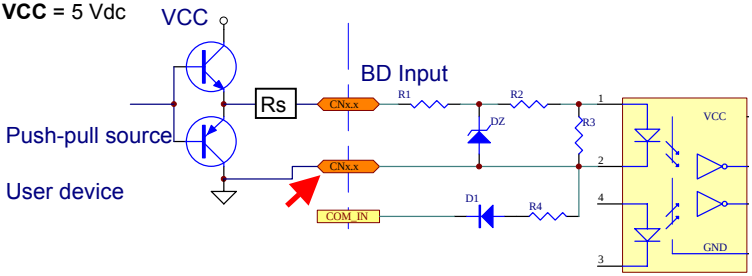
Push-Pull sink

VCC = 5 Vdc

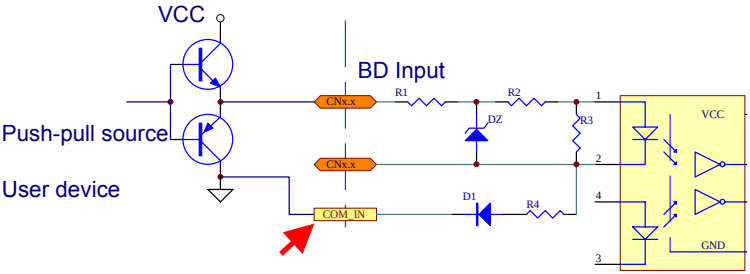


Push-Pull source

VCC = 5 Vdc

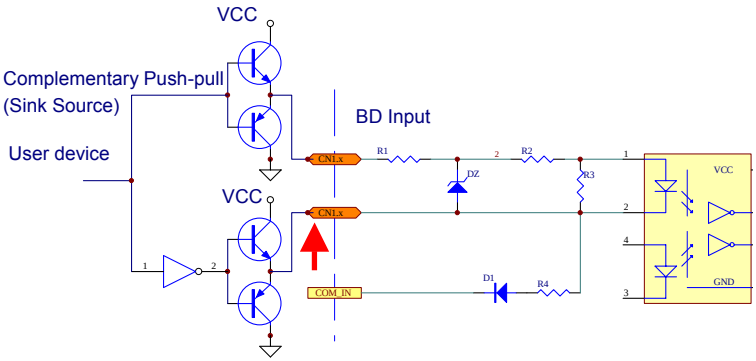


VCC = 24 Vdc

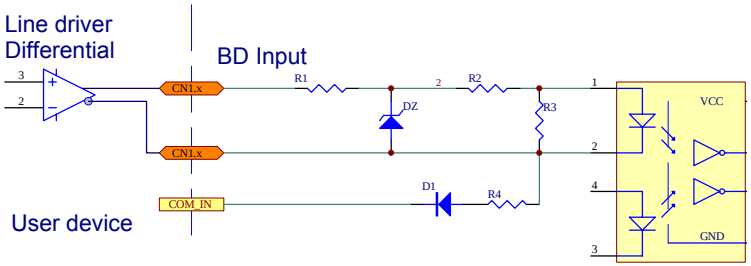


Push-pull sink-source

VCC = 5 Vdc

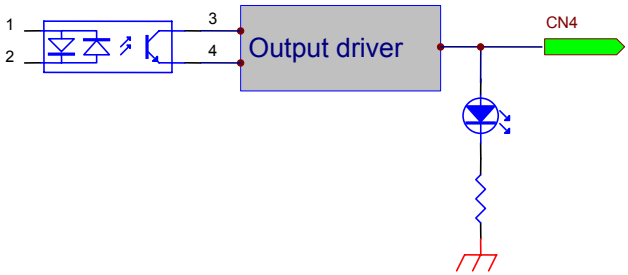


- Line-Driver differential 5 Vdc



Digital Outputs are optoisolated, short circuit protected, 24Vdc PNP type.

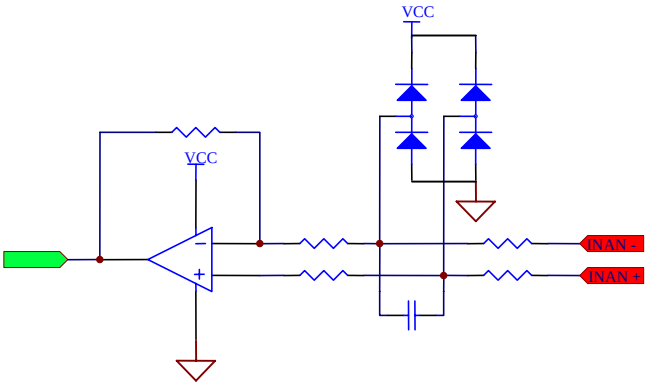
Output electrical specification		
Rated current (state 1)	In (A)	0.5
Max current (state 1)	Max (A)	0.7
Max current for output with 4 output ON	Iout(A)	0,5@24Vdc
N° max output ON at max current	N°	4
Voltage drop (state 1)	Max (V)	3
Leakage current (state 0)	Max (A)	2
Rated voltage	Vnom	24Vdc
Min voltage output	Vmin	19Vdc
Max voltage output	Vmax	28.8Vdc
Max voltage ripple	Vrmax	1Vdc
Type	PNP	current source
Max frequency output	f	1kHz
Protection	Short circuit between OUT and GROUND, between OUT and +V, between OUT and OUT, Open Load Detection	
Overload & short circuit threshold protection	I (over-current)	> 0.7A min = 2.5A max
Protection intervention delay	$tshort_{MAX}$	100µs @Vout = 30Vdc @RL = 0



Analog Inputs +/-10Vdc CEI EN 61131-2 type, not isolated.

CEI EN 61131-2 compliant analog inputs	
Input voltage range	±10Vdc
Input impedance limits	≥10Kohm
Reading resolution	19.5mV (1024) 10 bit
Maximum error over full temperature range	± 3% of full range
Maximum overload	Vin = 57Vdc Imax = 2mA
Digital output reading under overload condition	1024
Type of input	Differential not isolated
Input sampling time	T_{SAMPLE} = 1ms
Sampling repetition time	T=1ms
Input filtering characteristics	1° order Transition frequency: Hz –3dB@8.5KHz
Protection type	Resistor-diode and ricirculating network
Conversion method	Sample & Hold
Operating mode	Self-scan

Analog Inputs schematic



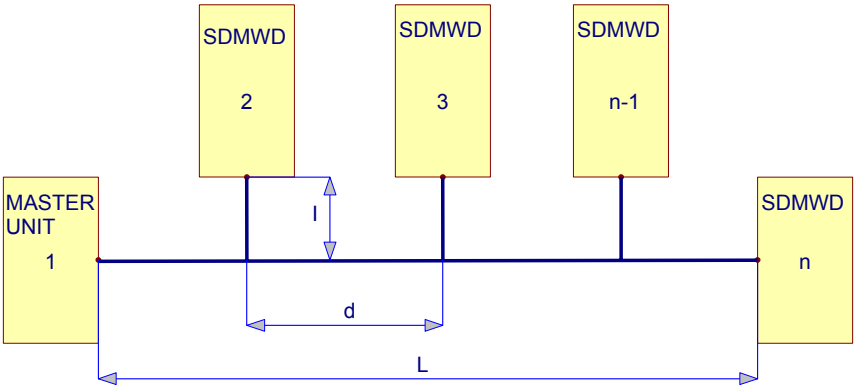
2.2.3 CAN Bus interface

Introduction

The CAN Bus interface provides a multipoint connection according to the ISO 11898 standard.
The isolated interface is powered by an internal isolated DC/DC converter, no external power supply is required.

Refer to **section 5** for information about available device's versions.
Refer to software manual for information about the can bus interface operating modes.

Network connection style



Network paths length						
Path	**Notation**	**Unit**	**Value**			**Condition**
			Min.	**Nom.**	**Max.**	
Bus	L	m	0		40	
Cable stub	l	m	0		0.3	Bit rate: 1Mbit/sec
Node distance	d	m	0.1		40	

Max baudrate [kbit/s] vs bus length	
500	**< 100 m**
250	**< 250 m**
125	**< 500 m**
50	**< 1000 m**
20	**< 2500 m**

2.2.4 RS232 and RS485 interface

Introduction

The RS232 interface provide a point to point connection and the RS485 a multipoint connection (RS485) link according to the EIA/TIA232E CCIT V.28 and RS-485 CCITT V.11 X.27 international standards.
The isolated interface is powered by an internal isolated DC/DC converter, no external power supply is required.

Refer to **section 5** for more information about available device's versions.

Refer to software manual for information about the serial interfaces operating modes.

Cable requirements

Use 0.5 mm² (#20 AWG) or 0.25mm^2 (#23AWG) cross section leads for the RS232 and RS485 paths cabling.

3 DRIVE INSTALLATION

This section explains how to install the step motor drive. Covered topics are:

- Unpacking and inspecting the furnishings;
- Selecting motor and optional drive's parts;
- Setting user's adjustments;
- Installing and using the unit safely;
- Mounting the drive;
- Connecting to the drive.

Refer to system diagram in **section 1.3**.

3.1 Unpacking, Inspecting and Storing

Check the item(s) against the packing-list. A label located on the drive's housing identifies the unit by model version, serial number and manufacture date.

Inspect the unit: any transportation damages must be submitted by the buyer to the carrier.

Store the SDMWD170 unit in a place meeting the specified conditions.

3.2 Selecting Motors and Options

Selecting a motor

The SDMWD170 drive is designed for use with EVER's line of step motors or most other brands two phases step motors. The motor's ratings must be compatible with the output configuration and ratings of the drive. Refer to the Torque/Speed Curves in the "EVER ELETTRONICA Motors Catalogues" or call EVER sales dept. or your local distributor for motor sizing and drive-motor compatibility planning.

Selecting Options

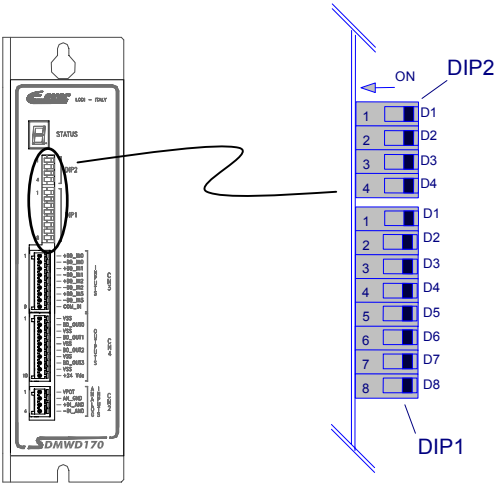
Refer to "EVER ELETTRONICA Drives Catalogue" for drive options planning or call EVER Co. sales dept. or refer to www.everelettronica.it

3.3 User adjustments: Dip-switch settings

Dip-switch Location

DIP1 and DIP2 are for user adjustments as for instance:

- Bus node identification
- Baud rate setting
- User functioning modes setting



*Some parts inside the SDMWD170 housing can be a potential source of **electric shock**.*
To avoid electric shock, prior to DIP-SWITCH handling, switch power off and wait until all the leds of 7 segment display on drive front panel are off.

*Refer to **section 5** for **dip-switch function tables** in your unit version.*

3.4 Installing and Using the Unit Safely

Guidelines Only qualified personnel should install the SDMWD170 unit, after first completely reading and understanding the information in this manual. The installation instructions should be followed and approved. Any question or doubt should be clarified with the supplier of the drive before its use.

*In no event will EVER co. accept **liability** for indirect or consequential damage and consequences resulting from inappropriate, negligent or incorrect installation or modification of the drive or from any incorrect connection to the SDMWD170 drive.*

*The power supply cables, the motor output cables and some parts of the SDMWD170 unit are a potential source of severe **electric shock**. Follow the safety guidelines to avoid danger.*

To avoid possible personal injury whenever you are working with SDMWD170 unit:

- Do not operate the drive without the motor case and the system enclosure connected to ground;
- The protective earth (PE) impedance must conform to the requirements of local regulations;
- Do not make any connections to the system internal circuitry;
- Always turn power supply off before making or removing connections from the unit;
- When the power supply fails the drive cannot hold the load: do not use system if that can result in a dangerous situation; provide the motor with a suitable blocking device if necessary.

Before handling or operating maintenance actions on the SDMWD170 unit, be sure the power supply has been switched off.

- Be careful of the motor connector terminals when disconnected from the motor. With the motor disconnected and power applied to the unit, these terminals can have high voltage rise.
- Do not use software working program stop as safety shutdown. Always remove power from the drive for a safe shutdown.
- Take into account the heat dissipation of some parts the SDMWD170 unit: using the device in heavy application, some enclosure surfaces can have high temperature rise. Before unplugging the drive from the installation wait a proper time for its cooling.

3.5 Mounting the Drive

Environment

The drive should be installed in dust, corrosive vapors, gases and liquids free environment. Avoid environments allowing condensation of vaporized liquids, including atmospheric moisture.

Installing the drive inside a cabinet, be sure that the air flow openings or the cabinet cooling system do not allow the internal temperature rise to exceed the maximum ambient temperature ratings of the device.

Besides above topics any local safety regulations concerning the installation of motor drives has to be carefully considered while planning the location of the drive.

Mounting Guidelines

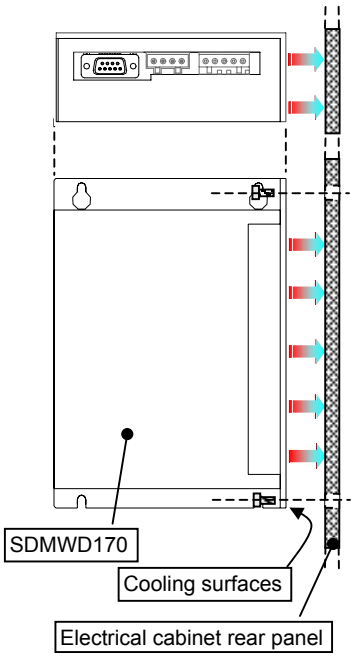
Your installation should at least meet the following general guidelines:

- Keep vertical orientation of the device;
- Avoid excessive vibration or shock;
- Provide some free space for air flow below and above the housing.

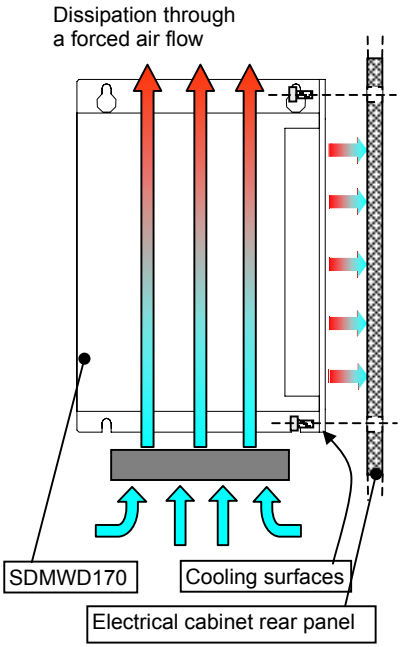
Cooling

The SDMWD170 unit has surfaces providing the cooling of the internal circuitry through their heat dissipation capability. Optimize the thermal flow between the unit cooling surfaces and the ambient according to the 'worst case' power dissipated in your application.

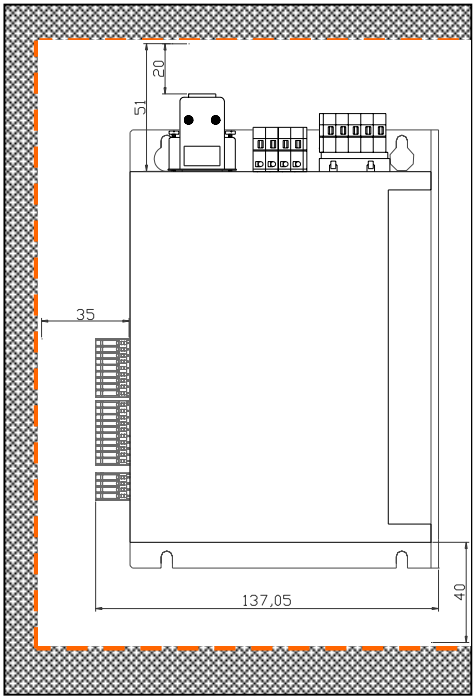
Dissipation through the fixing surface

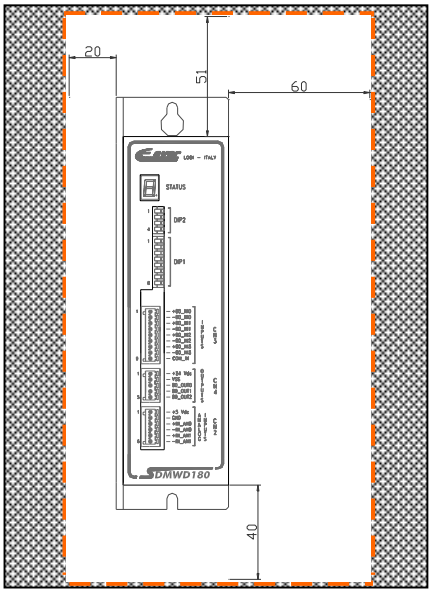


Dissipation through a forced air flow



Minimum installation distance





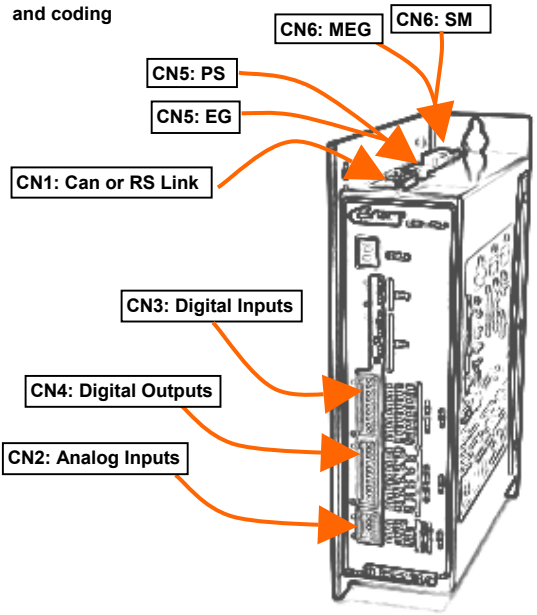
3.6 Connecting to the Drive

Introduction The drive input / output connectors are:

EG	- Earth Ground
MEG	- Motor Earth Ground
PS	- DC Supply Input
SM	- Step Motor Output
I/O	- Digital Inputs/Outputs
CAN*	- CAN bus
RS*	- RS232 and RS485 Interfaces

(*) available on different drive versions

Connectors location and coding

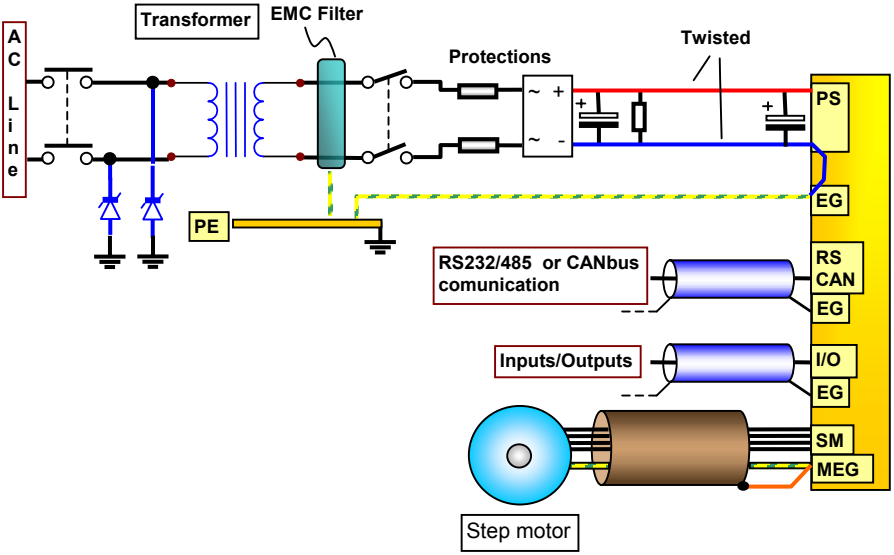


Cabling through the common wiring practices and grounding / shielding techniques described in the following sections should satisfy most of the applications. Optimum protection is provided by twisted and shielded cables and by separate laying of signal and power lines.

Non-standard applications, local electrical regulations, special operating conditions, and system configuration wiring needs have precedence over the information herein.

The Power Supply must be close to the drive to protect it against inductive-bunched interference voltages. ***The DC power Supply is referred to earth ground*** *through a connection between the negative side of DC power supply and drive's internal Earth Ground.*

Overall drive Connection Diagram



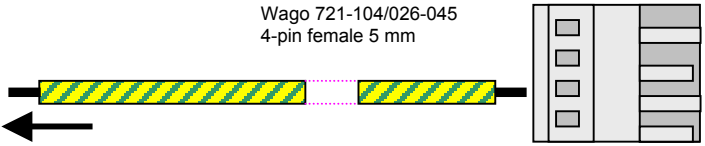
3.6.1 CN5: Connecting to Earth Ground (EG)

Earth Ground connection to PE **before any other connection** is mandatory.

Cable Requirements Use 1.5 mm² (#16 AWG) or heavier wire for EG cable. Moreover EG wire cross section must be at least as large as Vdc wires section.

The EG connection must conform to the requirements of local industry regulations.

Earth Ground **EG terminal** mates to a 721-464/001-040 4-pins female WAGO cable.



Input	*Pin*	*Description*
VIN$_C$	CN5.1	DC Bus +side power converter
VIN$_L$	CN5.2	DC Bus +side logic supply
PE	CN5.3	Earth Ground
GND	CN5.4	DC Bus -side

3.6.2 CN5: DC Supply Input (PS)

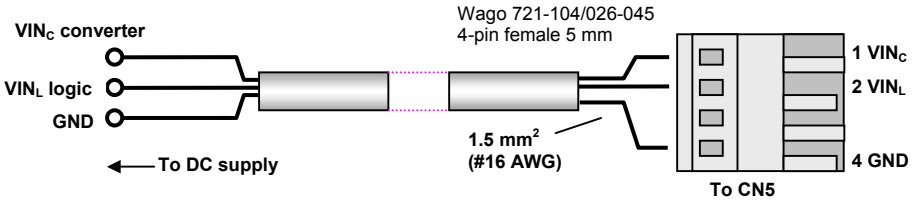
Introduction PS connector connects the SDMWD170 drive to DC supply.

Power Supply PS connector mates to a 721-464/001-040 4-pins male WAGO cable connector.

Input	*Pin*	*Description*
VIN$_C$	CN5.1	DC Bus +side power converter
VIN$_L$	CN5.2	DC Bus +side logic supply
PE	CN5.3	Earth Ground
GND	CN5.4	DC Bus -side

VIN_L provides the drive controlling logic with DC power supply when the main unit Power Supply is switched off: if it is not necessary this type of controlling, VIN_C provides the complete drive feeding.

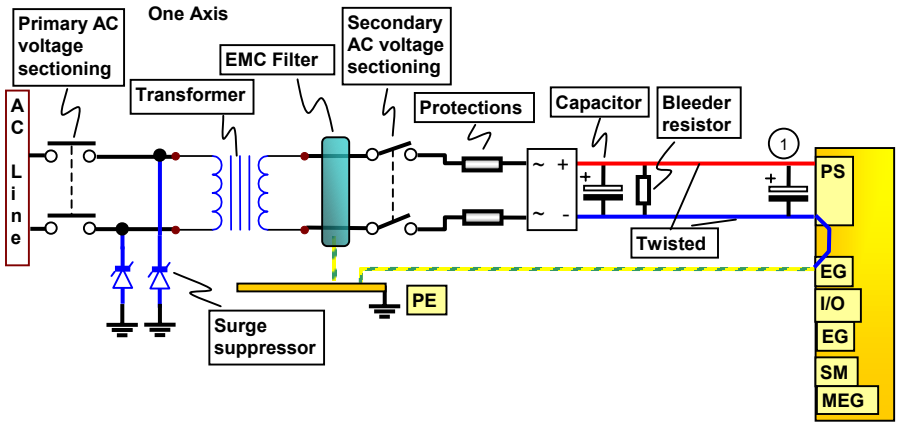
The cable to PS links the BD to DC supply line



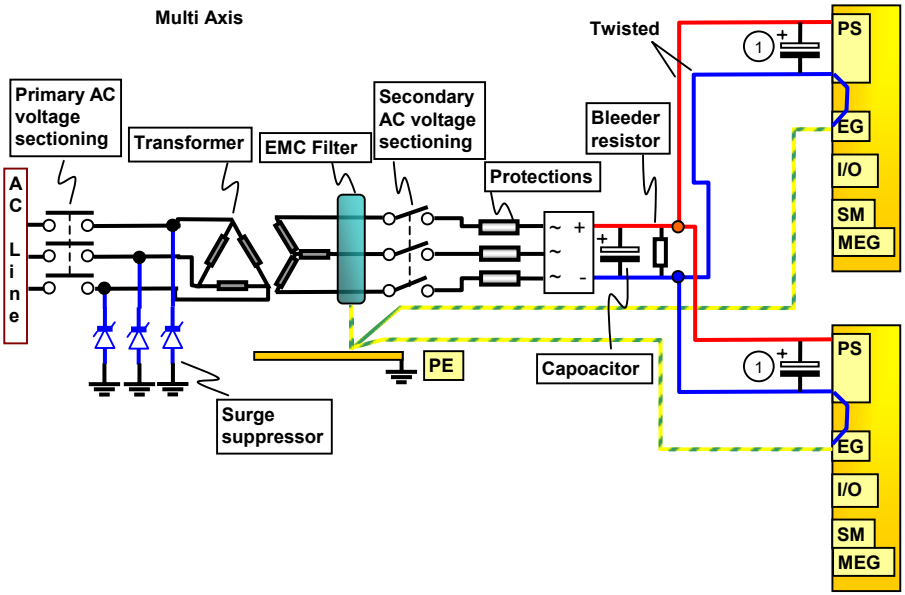
EG and **GND** are shared to the drive internal circuitry.

Do not solder *the tips of the cable before insertion into the connector. Solder can contract and cause a* ***loose connection over time****.*

Connection Diagram



(1) Provide a 1000uF additional capacitor when DC bus cable is longer than 1mt.



(1) Provide a 1000uF additional capacitor when DC bus cable is longer than 1mt.

***Refer** to **section A.3** for more information about the power supply sizing.*

Protections by AC 16A rated fuses on AC bus or by a protection switch.

Sectioning the ac voltage on primary side is a good safety practice.

The DC supply voltage must never exceed the Vdc rating of your unit version.

***Refer** to **section 5.0** for more information about the unit version power supply ratings.*

Cabling Requirements Use 1.5 mm² (#16 AWG) or heavier to make your own power supply cable

3.6.3 CN6: Connecting to Stepper Motor Output (SM)

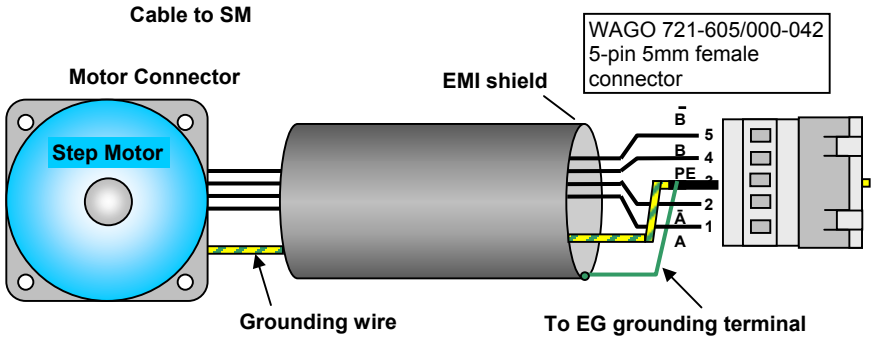
SM connector connects the device power stage to motor.

Cabling Diagram We suggest to follow the following guidelines while cabling a motor connection. Always ground the motor case trough a wire to a specific grounding terminal. Grounding motor case simply by fixing it to a grounded part of a machine is not a practice assuring a good impedance of earth ground connecting path.

Refer to motor specifications in the motor catalogue to determine the motor connections as required.

Step Motor **SM connector** mates to a 722-235 5-pins female WAGO cable connector

Pin	Description
CN6.1	Motor phase (B*)
CN6.2	Motor phase (B)
CN6.3	Motor Earth Ground (MEG)
CN6.4	Motor phase (A*)
CN6.5	Motor phase (A)



EMC

Paired-twisted cables protect against inductive-bunched interference voltage. Optimum protection is provided by twisted and shielded cables and separate laying of signal and power lines.

***Do not solder** the tips of the cables before insertion into the connector. Solder can contract and cause a **loose connection over time**.*

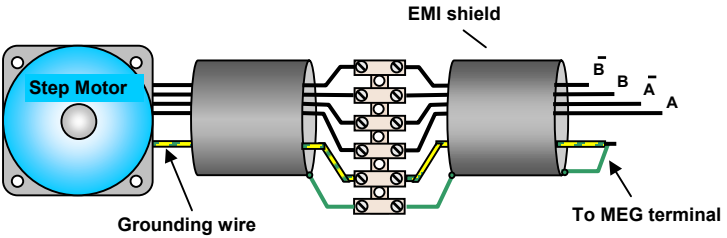
Cable Requirements

Use #10 to #24 AWG wire.
The following table of cable sizes vs. motor winding current can be a practical solution:

Motor current (A)	Section (mm^2)	AWG
$I_{PHASE} \leq 5$ Arms	1	18

Cable

It's good practice, when needed, interrupting the motor cable only through connectors or clamps, isolated from chassis or any mechanical parts, in order the motor windings, motor's shielded cable and motor's protection ground wire keep well separated. Avoid using switches or circuit breakers on motor phases.



3.6.4 CN3 – CN13: Connecting to drive Inputs

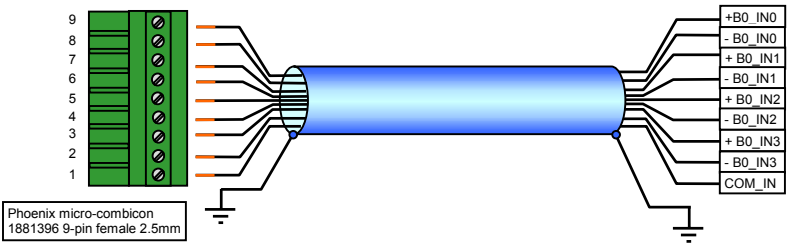
Inputs: optically isolated 5 Vdc Line Driver, PNP, NPN, Push-Pull, Complementary Push-Pull and 24 Vdc PNP/Push-Pull input terminals are provided on the CN3 drive edge connector.

Inputs Connector mates to a 1881516 9-pins male PHOENIX MICRO-COMBICON cable connector.

Pin	Description	Functioning
CN3.1	+B0_IN0	Depending on user's program
CN3.2	-B0_IN0	
CN3.3	+B0_IN1	
CN3.4	-B0_IN1	
CN3.5	+B0_IN2	
CN3.6	-B0_IN2	
CN3.7	+B0_IN3	
CN3.8	-B0_IN3	
CN3.9	COM_IN	Inputs common (- side)

Refer to section 5.3.3 for inputs/outputs function in a unit version.

Cable to I/O
Making the connections to Inputs use a shielded cable with 1 mm² (#18 AWG) or 0.5 mm² (#20 AWG) wires cross section.



*Using **NPN** style **connection**, random input wire grounding can result in **unwanted actuating** of the drive.*

3.6.5 CN4: Connecting to drive Outputs

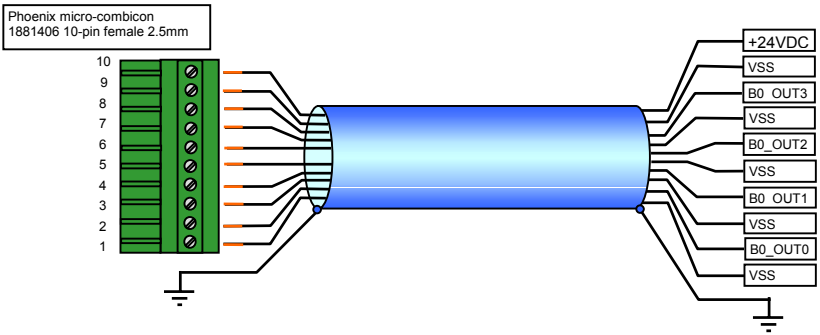
Outputs are optically isolated 24 Vdc PNP type.

Output Connector mates to a 1881529 10-pins male PHOENIX MICRO-COMBICON cable connector.

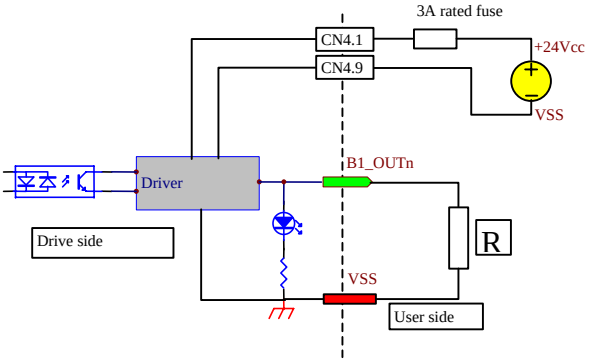
Pin	Description	Function
CN4.1	VSS	Depending on user's program
CN4.2	B0_OUT0	
CN4.3	VSS	Depending on user's program
CN4.4	B0_OUT1	
CN4.5	VSS	Depending on user's program
CN4.6	B0_OUT2	
CN4.7	VSS	Depending on user's program
CN4.8	B0_OUT3	
CN4.9	VSS	Digital outputs supply - side
CN4.10	+24Vdc	Digital outputs supply + side

Refer to section 5.3.3 for inputs/outputs function in a unit version.

Cable to I/O
Making the connections to outputs use a shielded cable with 1 mm² (#18 AWG) or 0.5 mm² (#20 AWG) wires' cross section.



Outputs schematics and connections



+24Vdc supply is necessary for outputs correct function.

Output protection status is not displayed on the 7 segment display.

3.6.6 CN2: Connecting to the drive Analog Inputs

Inputs: not isolated ±10Vdc input terminals are provided on the CN2 drive edge connector.

Inputs Connector mates to a 1881464 4-pins male PHOENIX MICRO-COMBICON cable connector.

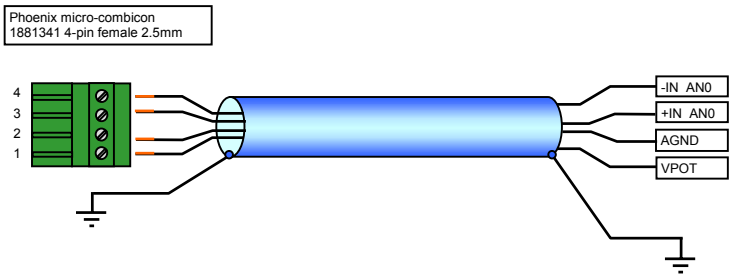
Pin	Description	Function
CN2.1	VPOT=5Vdc	Voltage supply + side
CN2.2	AN_GND	Voltage supply - side
CN2.3	+IN_AN0	Depending on user's program
CN2.4	-IN_AN0	

- **VPOT=5Vdc**: voltage output to supply possible external device connect to analog input;

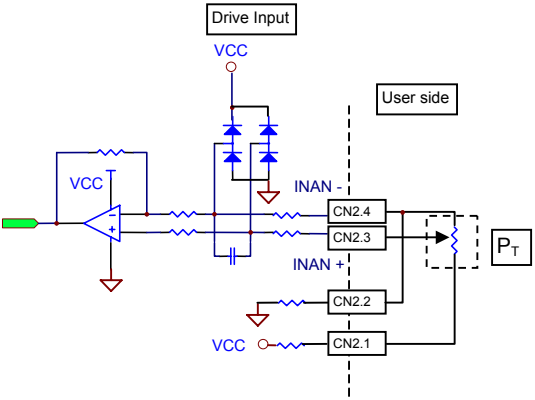
Refer to section 5.3.3 for inputs/outputs function in a unit version.

Cable to I/O

Making the connections to outputs use a shielded cable with 1 mm² (#18 AWG) or 0.5 mm² (#20 AWG) wires' cross section.



Inputs schematics and connections



External potentiometer driven inputs: 5KΩ.

3.6.7 CN1: Connecting to CANbus

Can Bus CN1 connector mates to a SUB-D 9-pin male connector.

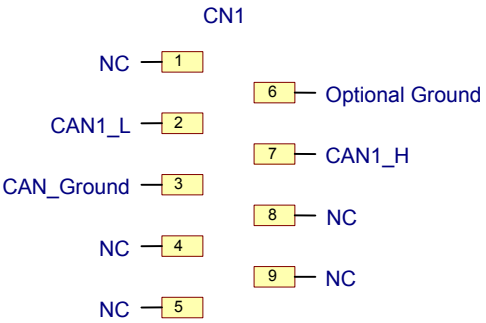
Refer to drive software manual for CAN bus operating information.

Connections table

Signals	Pin	Functions
N.C.	CN1.1	N.C.
CAN_L	CN1.2	CAN_L signal
0_CAN	CN1.3	Can_ Ground
Reserved	CN1.4	Not used
Reserved	CN1.5	Not used
0_CAN	CN1.6	Optional_Ground
CAN_H	CN1.7	CAN_H signal
Reserved	CN1.8	Not used
N.C.	CN1.9	N.C.

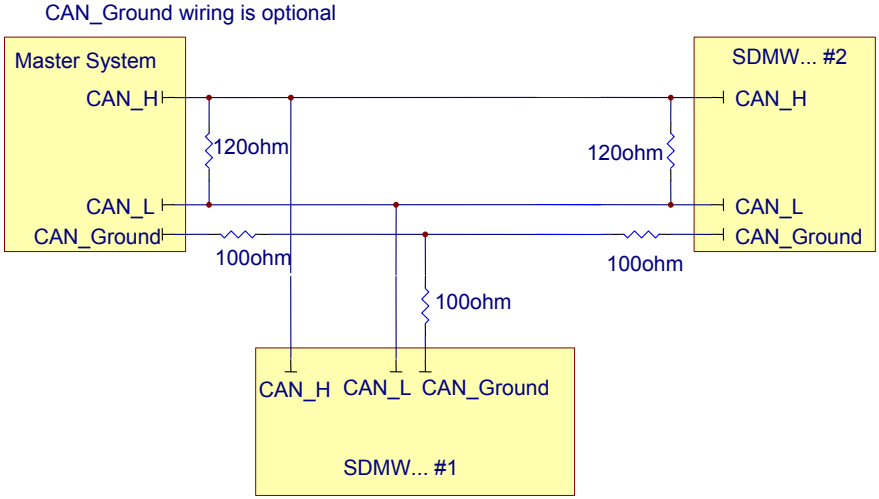
Cable requirements Use 0.5 mm² (#20AWG) or 0,25mm^2 (#23 AWG) cross section shielded twisted pair for CANbus connection.

Pin-Out of the CAN-bus connector



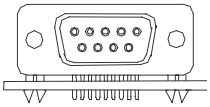
CANbus
schematics

For proper can bus working a termination resistor must be inserted between the input terminals of the first and the last device in the net.



3.6.8 CN1 - CN11: Connecting to RS232 and RS485 interfaces.

RS232 and RS485 connector is a 9 pins male SUB-D connector.



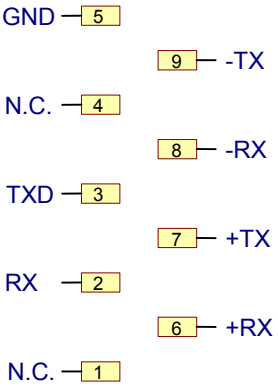
Refer to drive software manual for serial link operating.

Connections table

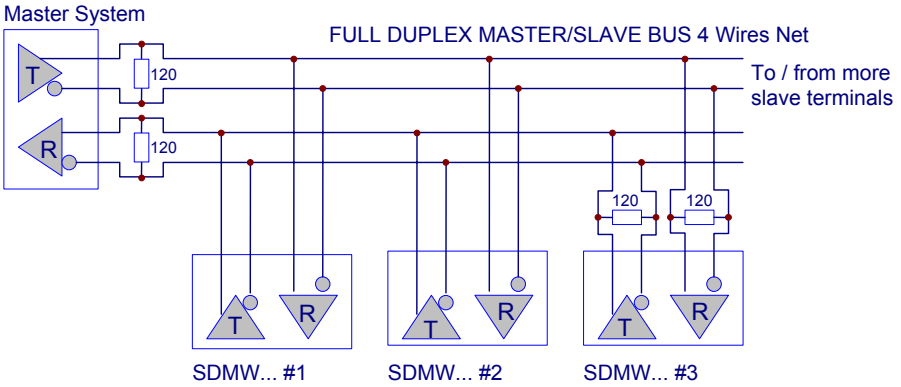
Signals	Pin	Function
N.C.	CN1.1	N.C.
Rx	CN1.2	RS232 receiver input
Tx	CN1.3	RS232 transmitter output
DTR	CN1.4	N.C.
GND	CN1.5	RS232 Interface Signal ground
+Rx	CN1.6	RS485 receiver +side (input)
+Tx	CN1.7	RS485 transmitter +side (output)
-Rx	CN1.8	RS485 receiver –side (input)
-Tx	CN1.9	RS485 transmitter –side (output)

Cable: requirements Use 0.5 mm² (#20 AWG) or 0.25mm² (#23 AWG) cross section shielded twisted pair for RS232 and RS485 serial interfaces cabling.

Connector pin-out



RS485 bus schematic



For proper RS485 net operating two termination resistors must be inserted between the terminals of the first and the last device in the net

The dot led on the drive front panel 7 segment display is lighted while the RS485 inerface is enabled (connected to the net).

4 STARTING THE SDMWD170 DRIVE

This section explains how to power the SDMWD170 unit after installation. Topics covered are:

- Testing the installation
- Maintaining and troubleshooting the SDMWD170 unit

4.1 Testing the Installation

Before first Powering up

- Check if the device is exactly the version you need (**Refer** to section 5.0). Improper DC input voltage or motor current setting could result in irreparable unit's or motor's damages.
- Check that all settings are as you need in your application.
- Check wiring and mounting to verify the proper installation and integrity of the unit.

First Power up Procedure

*Perform the first unit powering with the **motor shaft disconnected from the load** as improper wiring or undiscovered shipping damages could result in undesired motor motion.*

4.2 Maintaining

Procedure The SDMWD170 unit is designed for a minimum maintenance. Remove superficial dust and dirt from the unit using only clean, dry and low pressure air.

4.3 Drive operating condition monitoring

Drive Status Monitoring

The SDMWD170 actual working condition is monitored on the 7 segment light emitting diodes (leds) display.
The drive operation modes are displayed as:

"**b**" Boot program running: at early drive powering on to state that the boot program is properly working;

"**I**" Initialization: the drive is running the start-up procedure (for about 6 seconds from drive firmware working start-up);

"**S**" drive firmware running situation:

- "**S**" proper running;
- "**S**"+"**5**" characters alternating blinking:
  Warning: Missing $I_{nominal}$;
  Limits: see current settings table;
  Action: set motor current;
  Resuming: automatic at current setting;
- "**S**"+"**1**" characters alternating blinking:
  Warning: dc bus Voltage close to max limit;
  Limits: 24Vdc≤Vbus≤110Vdc;
  Action: correct the DC power supply voltage to ensure that 24Vdc≤ Vbus≤110Vdc;
  Resuming: automatic if 24Vdc≤Vbus≤110Vdc;
- "**S**"+"**3**" characters alternating blinking:
  Warning: drive temperature rise near limit;
  Limits: 70°C≤Tsink≤76°C;
  Action: improve drive cooling;
  Resuming: automatic if Tsink≤70°C;
- "**S**"+"**6**" characters alternating blinking:
  Warning: regulation parameters overflow;
  Limits: not significant;
  Action: check drive and motor matching;
  Resuming: automatic;

"**L**" Missing Operating System: no working software is actually inside the drive;

"**U**" Firmware upgrading: new software downloading in progress;

"**E**" General error: some error has been detected by the real time internal supervisor firmware;

"**P**" Protection status: a protection intervention condition has been detected;

- "**P**"+"**0**" characters alternating blinking:
  Protection: motor phase open;
  Limits: not significant;
  Action: check motor connections;
  Resuming: Switch power OFF to restore from a latched protection;
- "**P**"+"**1**"characters alternating blinking:
  Protection: over/under voltage;
  Limits: DC bus<21Vdc and DC bus>130Vdc;
  Action: correct the DC power supply voltage to proper values;
  Resuming: automatic if 24Vdc≤Vbus≤110Vdc;

- "**P**"+"**2**" characters alternating blinking:
  Protection: over current;
  Limits: see current settings table;
  Action: check motor cable and motor for shorts between wires or to motor case;
  Resuming: Switch power OFF to restore from a latched protection;
- "**P**"+"**3**" characters alternating blinking:
  Protection: drive over temperature;
  Limits: Heatsink drive temperature > 75°C;
  Action: Improve drive cooling;
  Resuming: automatic when drive temperature ≤75°C;

"**F**" fault: a Software Error inside the drive occurred;

- "**F**"+"**0**" characters alternating blinking:
  Fault: Watchdog protection intervention;
  Action: refer to Troubleshoting Table at 4.3.1 section;
- "**F**"+"**1**" characters alternating blinking:
  Fault: Internal Software Error;
  Action: refer to Troubleshoting Table at 4.3.1 section;
- "**F**"+"**2**" characters alternating blinking:
  Fault: Missing calibration;
  Action: refer to Troubleshoting Table at 4.3.1 section;
- "**F**"+"**3**" characters alternating blinking:
  Fault: Internal Hardware Error;
  Action: refer to Troubleshoting Table at 4.3.1 section;
- "**F**"+"**4**" characters alternating blinking:
  Fault: EEPROM Failure;
  Action: refer to Troubleshoting Table at 4.3.1 section;
- "**F**"+"**6**"characters alternating blinking:
  Fault: Missing Setup;
  Action: refer to Troubleshoting Table at 4.3.1 section;

Power ON Sequence

Through the 7 segment leds display the drive powering on sequence can be watched:

"**b**" ⇒ "**I**" ⇒ "**S**" : correct powering on sequence.
⇒ "**S**"+"**5**" "**1**" "**3**" "**6**":warning condition.

"**b**" ⇒ "**I**" ⇒ "**P**"+ "**0**" "**1**" "**2**" "**3**": power on followed by a protection intervention.

"**b**" ⇒ "**I**" ⇒ "**F**"+"**0**" "**1**" "**2**" "**3**" "**4**" "**6**": internal software error after power on.

"**b**" ⇒ "**I**" ⇒ "**E**" : power on followed by an user program error.

"**b**" ⇒ "**L**" : power followed by missing operating system.

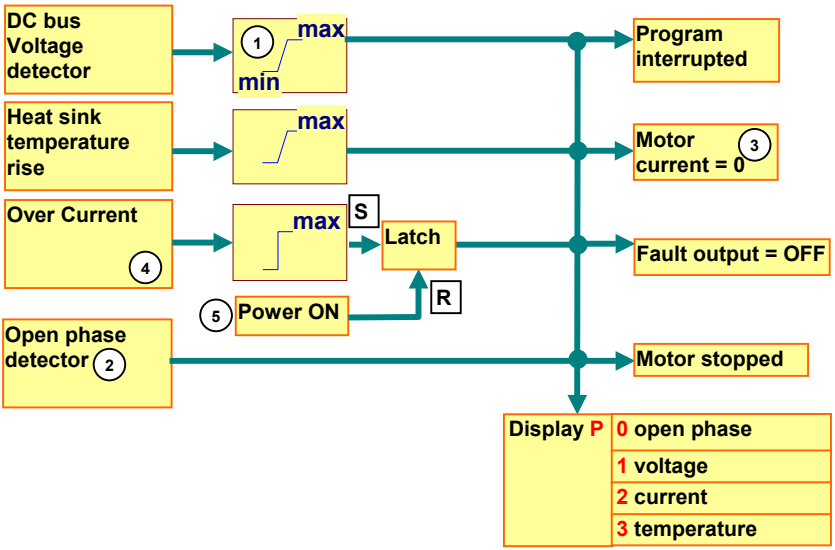
"**b**" ⇒ "**I**" ⇒ "**H**" : power on followed by missing user program.

Each protection intervention has a dedicated error message transmission on the communication link if present:

- **OVER TEMPERATURE:** an overheating of the power stages was detected and the "thermal monitoring circuitry " switched the drive's power stages off;
- **OVER/UNDER VOLTAGE:** the unit is actually powered with a voltage out of the operating range and the "voltage monitoring circuitry " disabled the drive's power stages;
- **OVER CURRENT:** a motor output overloading was detected and the "current protection" disabled the drive's power stages;
- **OPEN PHASE:** intervention halted the drive functioning;
-

The protections previously described are hardware failures.

Fault Conditions Diagram



Note:

1. The dc bus voltage out of range condition is defined as:
   - under voltage: DC bus < 24Vdc
   - over voltage: DC bus > 110Vdc
   - Dc bus voltage ripple > 10% ($V_{ripple\text{-}pp}$ > Rated Vdc / 10)

2. Open phase: the winding current cannot meet the setting;

3. *When the SDMWD170 BD switches to the "fault" status, the power stage is disabled and the **motor loses the holding torque**. The installation's planner must provide a safety device to prevent any damage to things or persons if the load drags the motor in such condition*

4. *After an **over current** protection intervention switch the drive off and fix the problem before powering the device on again.*

5. *Switch power off to **restore from a latched current protection** intervention.*

4.3.1 Troubleshooting Table

SYMPTOM	ACTION
No effect on the unit at power supply switching on.	Check the power supply cabling and fuses, if ok, check if the supply voltage (on power connector by a voltage-meter) meets the drive's ratings.
Over current protection "on"	Be sure that motor connections have been made according to the wiring diagrams in the EVER's motors catalogue. Check the motor cable and the motor for shorts between wires or motor case.
The motor produces no torque	Check if the motor cable is correctly wired and properly plugged to the drive.
The motor produces torque but does not turn.	Check if the I/O cable is correctly wired and properly plugged to the drive.
The motor rotates a wrong direction.	Reverse A and Ā motor leads.
The motor does not reach the target position.	Verify that the motor does not stall. If it does: 1 Verify motor sizing. Be sure that the power supply voltage and/or motor current setting is as required by the reference motor's torque vs. speed curve. 2 Use a smaller step size to avoid low-speed resonance problems.

*Use emergency diagram and the **troubleshooting table** in the following page to fix and correct most of problems. Being unable to restore proper drive's operation please call EVER' s co. Support dept.*

*Suspecting the **SDMWD170 system has been damaged**, before replacing it by a new unit check that the installation and the power supply design meet all the drive's requirements. Tentative fault corrections by simply replacing a SDMWD170 unit are not a good troubleshooting practice.*

*The power supply cables, the motor output and some parts of the SDMWD170 unit are a potential source of **electric shock**. To avoid dangers follow the safety guidelines in section 1.3 and 3.5 of this unit manual.*

Recovering to normal working conditions, after a protection or a working section abortion ,use a working restart cycle to avoid dangerous situations.

Being unable to correct the problem while thinking the system is not faulty, call EVER co. for technical support or send a message including the following information:

Unit code (SDMWD170Vyyyy) and serial number as printed in the label on the unit chassis.
An as complete as possible description of the problem and the condition where it occurs.
A description of the unit settings in your application (Current, step type, waveform type, operation mode, etc.)
The Ever co. part number of the motor.
The DC power supply bus voltage ratings and characteristics (ripple....).
A description of power supply and control signals, cabling and other installation topics.
A description of your application (motor movements, load, speed, etc.).

Return procedure

To return a defective drive to EVER co. for repair or replacement:

1) Possibly pack the unit in its original packing.
[EVER co. is not responsible or liable for damage resulting from improper packaging or shipment].
Including a sheet reporting a complete description of the problem or the damage of the device in the return packing can be useful while repairing the unit.

2) Ship the goods to:

EVER Elettronica
Via del Commercio 2/4
Zona Industriale Loc. San Grato
26900 - LODI - ITALY
Attn: AS Dept.
Email: reparations@everelettronica.it

*EVER co. is used sending to customers a **repair costs estimation offer before repairing** the unit.*
All shipment costs are charged to customer.

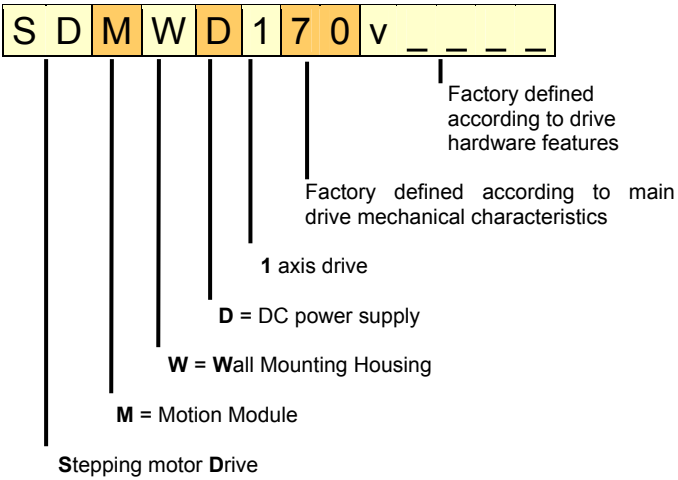
5 SDMWD170 VERSIONS AND SPECIFICATIONS

This section describes the specific features of the available versions of SDMWD170 drive.

*The **information herein** overcomes the general SDMWD170 specification in the previous sections.*

5.1 Drive Coding and Ordering Information

To order the SDMWD170 drive version you want please use the following model number:


S D M W D 1 7 0 v _ _ _ _
Factory defined according to drive hardware features
Factory defined according to main drive mechanical characteristics
1 axis drive
D = DC power supply
W = Wall Mounting Housing
M = Motion Module
Stepping motor Drive

Specifications on drive housing front panel:

BDM (**B**asic **D**rive **M**odule) with **DC** supply, working as motion control module. The unit after receiving the working program at the installation will work as a stepping motor controlled drive.

5.2 Table of SDMWD170Vxxxx available versions

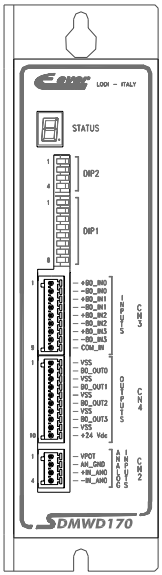
SDMWD170	Vdc	Inputs (1)	Outputs (2)	Analog Inputs (3)	Firmware	Bus Link	Connector kit code
VB221	24-110	4	4	2	C0300	CANbus	SDMWD170VB221C
VB231		4	4	2	C0400	RS232 and RS485	SDMWD170VB231C

(1) 5 Vdc Line Driver and 24Vdc PNP and NPN;
(2) 24Vdc @ 500mA;
(3) +/- 10 Vdc

5.3 SDMWD170vB221 Basic Drive (C0300)

Performances available by this version: the SDMWD170 is a step motor motion module and drive implemented through a new generation DIGITAL SIGNAL PROCESSOR CONTROLLER. In a wall mounting housing the unit integrates a microstepping drive able to move the motor according to motion profiling commands mastered by a PLC or by a PC. The connection to the master unit is made through a CAN link or by #4 optoisolated (5Vdc Line-driver and 24Vdc PNP/Push-Pull) 200kHz digital inputs, #4 optoisolated (24Vdc@500mA PNP) outputs and #1 ±10Vdc inputs. All the digital inputs and outputs are optoisolated. Dip-switches are available to user settings and for the identification of the unit in a CANbus network. The unit drives the stepping motor according to a user program, while running a real time checking of the critical working parameters as temperature rise, voltages and currents. The device is powered through one DC bus and can drive the stepper motor in open or closed velocity & position loops.

5.3.1 Electrical specifications



- **DC voltage** range (24÷110) Vdc;

- **Bipolar chopper** "H" power bridges;

- **Switching frequency:** 40 kHz;

- **Phase current ratings:** 1÷8Arms (11Apeak);

- **Step angle:** from full to 1/128 step sinusoidal current waveforms;

- **Display:** 7 segment led display monitoring of drive working status;

- **Dip switches** for user functions setting;

- **Unit Protection circuitry** against:
  - Voltage out of operating range **(1)**
  - Over temperature : T_{sink} >= 75°C ±5°C
  - Over current due to:
    - motor windings short circuit
    - phase and ground short circuit
    - wrong motor windings connection
    - motor phase open

(1) the voltage out of operating range condition is defined as:
- under voltage: DC bus < 24Vdc
- over voltage: DC bus > 110Vdc
- ripple > 10% ($V_{ripple-pp}$ > Rated Vdc / 10)

- User's adjustments:

Motor Current: 1 to 8 Arms sinusoidal winding currents. Software selectable

Micro-stepping: software selectable

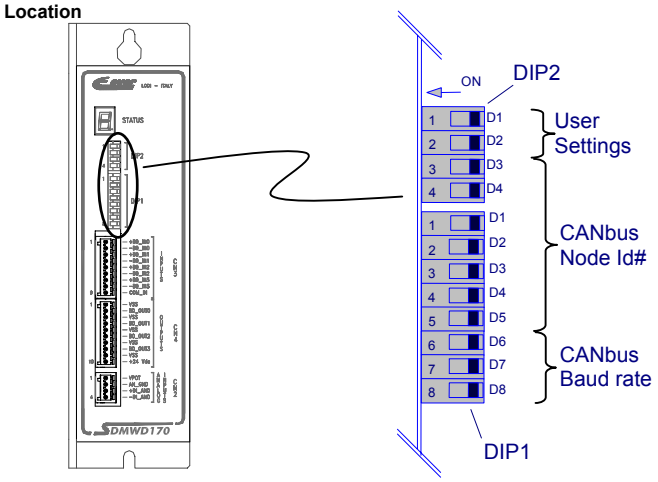
Idle current reduction: software selectable

Boost current: software selectable

- **User's responsibility boosting the current:** the BDM maximum current rating cannot be exceeded.

After idle current nulling the motor loses the holding torque. The user must provide a safety device to prevent any damage to things or persons if the load drags the motor.

5.3.2 Dip switch settings



DIP2				DIP1							
D1	D2	D3	D4	D1	D2	D3	D4	D5	D6	D7	D8
U1	U2	ID6	ID5	ID4	ID3	ID2	ID1	ID0	BD2	BD1	BD0
Free for User Settings.		CANbus Node Identifier							CANbus Baud rate		

*Some parts inside the SDMWD170 unit housing can be a potential source of **electric shock**.*
To avoid electric shock, before DIP-SWITCH handling switch power off and wait until the 7 segment display leds on drive front panel are off.

CANbus Baud Rate Selection table

BD2	BD1	BD0	Baud Rate (Kbit/s)
OFF	OFF	OFF	1000
OFF	OFF	ON	500
OFF	ON	OFF	250
OFF	ON	ON	125
ON	OFF	OFF	100
ON	OFF	ON	50
ON	ON	OFF	20
ON	ON	ON	10

Refer to drive software manual for information about operating modes.

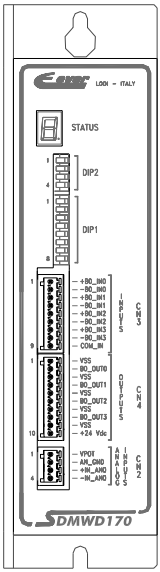
CANbus Node Identifiers table

Node	ID6	ID5	ID4	ID3	ID2	ID1	ID0	Node	ID6	ID5	ID4	ID3	ID2	ID1	ID0
//	OFF	OFF	OFF	OFF	OFF	OFF	OFF	64	ON	OFF	OFF	OFF	OFF	OFF	OFF
1	OFF	OFF	OFF	OFF	OFF	OFF	ON	65	ON	OFF	OFF	OFF	OFF	OFF	ON
2	OFF	OFF	OFF	OFF	OFF	ON	OFF	66	ON	OFF	OFF	OFF	OFF	ON	OFF
3	OFF	OFF	OFF	OFF	OFF	ON	ON	67	ON	OFF	OFF	OFF	OFF	ON	ON
4	OFF	OFF	OFF	OFF	ON	OFF	OFF	68	ON	OFF	OFF	OFF	ON	OFF	OFF
5	OFF	OFF	OFF	OFF	ON	OFF	ON	69	ON	OFF	OFF	OFF	ON	OFF	ON
6	OFF	OFF	OFF	OFF	ON	ON	OFF	70	ON	OFF	OFF	OFF	ON	ON	OFF
7	OFF	OFF	OFF	OFF	ON	ON	ON	71	ON	OFF	OFF	OFF	ON	ON	ON
8	OFF	OFF	OFF	ON	OFF	OFF	OFF	72	ON	OFF	OFF	ON	OFF	OFF	OFF
9	OFF	OFF	OFF	ON	OFF	OFF	ON	73	ON	OFF	OFF	ON	OFF	OFF	ON
10	OFF	OFF	OFF	ON	OFF	ON	OFF	74	ON	OFF	OFF	ON	OFF	ON	OFF
11	OFF	OFF	OFF	ON	OFF	ON	ON	75	ON	OFF	OFF	ON	OFF	ON	ON
12	OFF	OFF	OFF	ON	ON	OFF	OFF	76	ON	OFF	OFF	ON	ON	OFF	OFF
13	OFF	OFF	OFF	ON	ON	OFF	ON	77	ON	OFF	OFF	ON	ON	OFF	ON
14	OFF	OFF	OFF	ON	ON	ON	OFF	78	ON	OFF	OFF	ON	ON	ON	OFF
15	OFF	OFF	OFF	ON	ON	ON	ON	79	ON	OFF	OFF	ON	ON	ON	ON
16	OFF	OFF	ON	OFF	OFF	OFF	OFF	80	ON	OFF	ON	OFF	OFF	OFF	OFF
17	OFF	OFF	ON	OFF	OFF	OFF	ON	81	ON	OFF	ON	OFF	OFF	OFF	ON
18	OFF	OFF	ON	OFF	OFF	ON	OFF	82	ON	OFF	ON	OFF	OFF	ON	OFF
19	OFF	OFF	ON	OFF	OFF	ON	ON	83	ON	OFF	ON	OFF	OFF	ON	ON
20	OFF	OFF	ON	OFF	ON	OFF	OFF	84	ON	OFF	ON	OFF	ON	OFF	OFF
21	OFF	OFF	ON	OFF	ON	OFF	ON	85	ON	OFF	ON	OFF	ON	OFF	ON
22	OFF	OFF	ON	OFF	ON	ON	OFF	86	ON	OFF	ON	OFF	ON	ON	OFF
23	OFF	OFF	ON	OFF	ON	ON	ON	87	ON	OFF	ON	OFF	ON	ON	ON
24	OFF	OFF	ON	ON	OFF	OFF	OFF	88	ON	OFF	ON	ON	OFF	OFF	OFF
25	OFF	OFF	ON	ON	OFF	OFF	ON	89	ON	OFF	ON	ON	OFF	OFF	ON
26	OFF	OFF	ON	ON	OFF	ON	OFF	90	ON	OFF	ON	ON	OFF	ON	OFF
27	OFF	OFF	ON	ON	OFF	ON	ON	91	ON	OFF	ON	ON	OFF	ON	ON
28	OFF	OFF	ON	ON	ON	OFF	OFF	92	ON	OFF	ON	ON	ON	OFF	OFF
29	OFF	OFF	ON	ON	ON	OFF	ON	93	ON	OFF	ON	ON	ON	OFF	ON
30	OFF	OFF	ON	ON	ON	ON	OFF	94	ON	OFF	ON	ON	ON	ON	OFF
31	OFF	OFF	ON	ON	ON	ON	ON	95	ON	OFF	ON	ON	ON	ON	ON
32	OFF	ON	OFF	OFF	OFF	OFF	OFF	96	ON	ON	OFF	OFF	OFF	OFF	OFF
33	OFF	ON	OFF	OFF	OFF	OFF	ON	97	ON	ON	OFF	OFF	OFF	OFF	ON
34	OFF	ON	OFF	OFF	OFF	ON	OFF	98	ON	ON	OFF	OFF	OFF	ON	OFF
35	OFF	ON	OFF	OFF	OFF	ON	ON	99	ON	ON	OFF	OFF	OFF	ON	ON
36	OFF	ON	OFF	OFF	ON	OFF	OFF	100	ON	ON	OFF	OFF	ON	OFF	OFF
37	OFF	ON	OFF	OFF	ON	OFF	ON	101	ON	ON	OFF	OFF	ON	OFF	ON
38	OFF	ON	OFF	OFF	ON	ON	OFF	102	ON	ON	OFF	OFF	ON	ON	OFF
39	OFF	ON	OFF	OFF	ON	ON	ON	103	ON	ON	OFF	OFF	ON	ON	ON
40	OFF	ON	OFF	ON	OFF	OFF	OFF	104	ON	ON	OFF	ON	OFF	OFF	OFF
41	OFF	ON	OFF	ON	OFF	OFF	ON	105	ON	ON	OFF	ON	OFF	OFF	ON
42	OFF	ON	OFF	ON	OFF	ON	OFF	106	ON	ON	OFF	ON	OFF	ON	OFF
43	OFF	ON	OFF	ON	OFF	ON	ON	107	ON	ON	OFF	ON	OFF	ON	ON
44	OFF	ON	OFF	ON	ON	OFF	OFF	108	ON	ON	OFF	ON	ON	OFF	OFF
45	OFF	ON	OFF	ON	ON	OFF	ON	109	ON	ON	OFF	ON	ON	OFF	ON
46	OFF	ON	OFF	ON	ON	ON	OFF	110	ON	ON	OFF	ON	ON	ON	OFF
47	OFF	ON	OFF	ON	ON	ON	ON	111	ON	ON	OFF	ON	ON	ON	ON
48	OFF	ON	ON	OFF	OFF	OFF	OFF	112	ON	ON	ON	OFF	OFF	OFF	OFF
49	OFF	ON	ON	OFF	OFF	OFF	ON	113	ON	ON	ON	OFF	OFF	OFF	ON
50	OFF	ON	ON	OFF	OFF	ON	OFF	114	ON	ON	ON	OFF	OFF	ON	OFF
51	OFF	ON	ON	OFF	OFF	ON	ON	115	ON	ON	ON	OFF	OFF	ON	ON
52	OFF	ON	ON	OFF	ON	OFF	OFF	116	ON	ON	ON	OFF	ON	OFF	OFF
53	OFF	ON	ON	OFF	ON	OFF	ON	117	ON	ON	ON	OFF	ON	OFF	ON
54	OFF	ON	ON	OFF	ON	ON	OFF	118	ON	ON	ON	OFF	ON	ON	OFF
55	OFF	ON	ON	OFF	ON	ON	ON	119	ON	ON	ON	OFF	ON	ON	ON
56	OFF	ON	ON	ON	OFF	OFF	OFF	120	ON	ON	ON	ON	OFF	OFF	OFF
57	OFF	ON	ON	ON	OFF	OFF	ON	121	ON	ON	ON	ON	OFF	OFF	ON
58	OFF	ON	ON	ON	OFF	ON	OFF	122	ON	ON	ON	ON	OFF	ON	OFF
59	OFF	ON	ON	ON	OFF	ON	ON	123	ON	ON	ON	ON	OFF	ON	ON
60	OFF	ON	ON	ON	ON	OFF	OFF	124	ON	ON	ON	ON	ON	OFF	OFF
61	OFF	ON	ON	ON	ON	OFF	ON	125	ON	ON	ON	ON	ON	OFF	ON
62	OFF	ON	ON	ON	ON	ON	OFF	126	ON	ON	ON	ON	ON	ON	OFF
63	OFF	ON	ON	ON	ON	ON	ON	127	ON	ON	ON	ON	ON	ON	ON

5.4 SDMWD170vB231 Basic Drive (C0400)

Performances available by this version: the SDMWD170 is a step motor motion module and drive implemented through a new generation DIGITAL SIGNAL PROCESSOR CONTROLLER. In a wall mounting housing the unit integrates a microstepping drive able to move the motor according to motion profiling commands mastered by a PLC or by a PC. The connection to the master unit is made through a RS232 and RS485 link or by #4 optoisolated (5Vdc Line-driver and 24Vdc PNP/Push-Pull) 200kHz digital inputs, #4 optoisolated (24Vdc@500mA PNP) outputs and #1 ±10Vdc inputs. All the digital inputs and outputs are optoisolated. Dip-switches are available to user settings and for the identification of the unit in a multidrop RS485 network. The unit drives the stepping motor, according to a user program while running a real time checking of the critical working parameters as temperature rise, voltages and currents. The device is powered through one DC bus and can drive the stepper motor in open or closed velocity & position loops.

5.4.1 Electrical specifications



- **DC voltage** range (24÷110) Vdc;

- **Bipolar chopper** "H" power bridges;

- **Switching frequency:** 40 kHz;

- **Phase current ratings:** 1÷8Arms (11Apeak);

- **Step angle:** from full to 1/128 step sinusoidal current waveforms;

- **Display:** 7 segment led display monitoring of drive working status;

- **Dip switches** for user functions setting;

- **Unit Protection circuitry** against:
  - Voltage out of operating range **(1)**
  - Over temperature : T_{sink} >= 75°C ±5°C
  - Over current due to:
    - motor windings short circuit
    - phase and ground short circuit
    - wrong motor windings connection
    - motor phase open

(1) the voltage out of operating range condition is defined as:
- under voltage: DC bus < 24Vdc
- over voltage: DC bus > 110Vdc
- ripple > 10% ($V_{ripple-pp}$ > Rated Vdc / 10)

- User's adjustments:

Motor Current: 1 to 8 Arms sinusoidal winding currents.

Micro-stepping: software selectable

Idle current reduction: software selectable

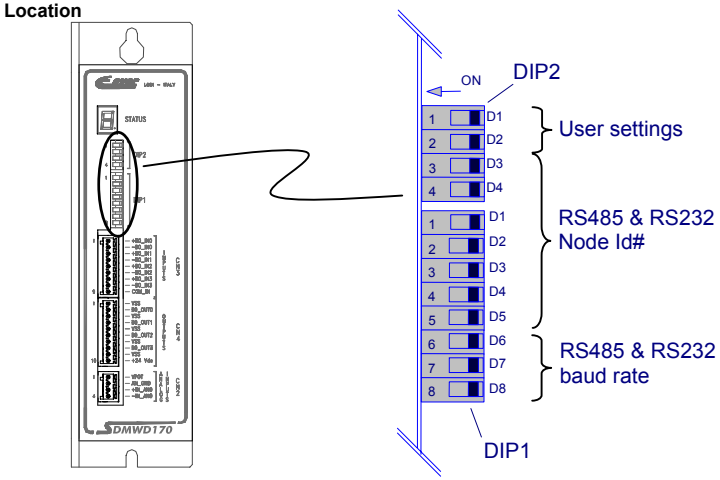
Boost current: software selectable

- **User's responsibility:** boosting the current the BDM maximum current rating cannot be exceeded.

After the idle current nulling the motor loses the holding torque. The user must provide a safety device to prevent any damage to things or persons if the load drags the motor.

5.4.2 Dip switch settings

Location



DIP2				DIP1							
D1	D2	D3	D4	D1	D2	D3	D4	D5	D6	D7	D8
U1	U2	ID6	ID5	ID4	ID3	ID2	ID1	ID0	BD2	BD1	BD0
Free for User settings.		RS485 & RS232 Node Identifier							RS485 & RS232 Baud rate		

*Some parts inside the SDMWD170 unit housing can be a potential source of **electric shock**.*
To avoid electric shock, before DIP-SWITCH handling switch power off and wait until the 7 segment display leds on drive front panel are off.

Baud rate table

Rs232 and RS485 Baud Rate table

B2	B1	B0	Baud Rate (Kbit/s)
OFF	OFF	OFF	reserved
OFF	OFF	ON	57600
OFF	ON	OFF	38400
OFF	ON	ON	19200
ON	OFF	OFF	9600
ON	OFF	ON	4800
ON	ON	OFF	2400
ON	ON	ON	1200

Refer to drive software manual for information about operating modes.

RS485 and RS232 Node Identifiers table

Node	I6	I5	I4	I3	I2	I1	I0	Node	I6	I5	I4	I3	I2	I1	I0
//	OFF	OFF	OFF	OFF	OFF	OFF	OFF	64	ON	OFF	OFF	OFF	OFF	OFF	OFF
1	OFF	OFF	OFF	OFF	OFF	OFF	ON	65	ON	OFF	OFF	OFF	OFF	OFF	ON
2	OFF	OFF	OFF	OFF	OFF	ON	OFF	66	ON	OFF	OFF	OFF	OFF	ON	OFF
3	OFF	OFF	OFF	OFF	OFF	ON	ON	67	ON	OFF	OFF	OFF	OFF	ON	ON
4	OFF	OFF	OFF	OFF	ON	OFF	OFF	68	ON	OFF	OFF	OFF	ON	OFF	OFF
5	OFF	OFF	OFF	OFF	ON	OFF	ON	69	ON	OFF	OFF	OFF	ON	OFF	ON
6	OFF	OFF	OFF	OFF	ON	ON	OFF	70	ON	OFF	OFF	OFF	ON	ON	OFF
7	OFF	OFF	OFF	OFF	ON	ON	ON	71	ON	OFF	OFF	OFF	ON	ON	ON
8	OFF	OFF	OFF	ON	OFF	OFF	OFF	72	ON	OFF	OFF	ON	OFF	OFF	OFF
9	OFF	OFF	OFF	ON	OFF	OFF	ON	73	ON	OFF	OFF	ON	OFF	OFF	ON
10	OFF	OFF	OFF	ON	OFF	ON	OFF	74	ON	OFF	OFF	ON	OFF	ON	OFF
11	OFF	OFF	OFF	ON	OFF	ON	ON	75	ON	OFF	OFF	ON	OFF	ON	ON
12	OFF	OFF	OFF	ON	ON	OFF	OFF	76	ON	OFF	OFF	ON	ON	OFF	OFF
13	OFF	OFF	OFF	ON	ON	OFF	ON	77	ON	OFF	OFF	ON	ON	OFF	ON
14	OFF	OFF	OFF	ON	ON	ON	OFF	78	ON	OFF	OFF	ON	ON	ON	OFF
15	OFF	OFF	OFF	ON	ON	ON	ON	79	ON	OFF	OFF	ON	ON	ON	ON
16	OFF	OFF	ON	OFF	OFF	OFF	OFF	80	ON	OFF	ON	OFF	OFF	OFF	OFF
17	OFF	OFF	ON	OFF	OFF	OFF	ON	81	ON	OFF	ON	OFF	OFF	OFF	ON
18	OFF	OFF	ON	OFF	OFF	ON	OFF	82	ON	OFF	ON	OFF	OFF	ON	OFF
19	OFF	OFF	ON	OFF	OFF	ON	ON	83	ON	OFF	ON	OFF	OFF	ON	ON
20	OFF	OFF	ON	OFF	ON	OFF	OFF	84	ON	OFF	ON	OFF	ON	OFF	OFF
21	OFF	OFF	ON	OFF	ON	OFF	ON	85	ON	OFF	ON	OFF	ON	OFF	ON
22	OFF	OFF	ON	OFF	ON	ON	OFF	86	ON	OFF	ON	OFF	ON	ON	OFF
23	OFF	OFF	ON	OFF	ON	ON	ON	87	ON	OFF	ON	OFF	ON	ON	ON
24	OFF	OFF	ON	ON	OFF	OFF	OFF	88	ON	OFF	ON	ON	OFF	OFF	OFF
25	OFF	OFF	ON	ON	OFF	OFF	ON	89	ON	OFF	ON	ON	OFF	OFF	ON
26	OFF	OFF	ON	ON	OFF	ON	OFF	90	ON	OFF	ON	ON	OFF	ON	OFF
27	OFF	OFF	ON	ON	OFF	ON	ON	91	ON	OFF	ON	ON	OFF	ON	ON
28	OFF	OFF	ON	ON	ON	OFF	OFF	92	ON	OFF	ON	ON	ON	OFF	OFF
29	OFF	OFF	ON	ON	ON	OFF	ON	93	ON	OFF	ON	ON	ON	OFF	ON
30	OFF	OFF	ON	ON	ON	ON	OFF	94	ON	OFF	ON	ON	ON	ON	OFF
31	OFF	OFF	ON	ON	ON	ON	ON	95	ON	OFF	ON	ON	ON	ON	ON
32	OFF	ON	OFF	OFF	OFF	OFF	OFF	96	ON	ON	OFF	OFF	OFF	OFF	OFF
33	OFF	ON	OFF	OFF	OFF	OFF	ON	97	ON	ON	OFF	OFF	OFF	OFF	ON
34	OFF	ON	OFF	OFF	OFF	ON	OFF	98	ON	ON	OFF	OFF	OFF	ON	OFF
35	OFF	ON	OFF	OFF	OFF	ON	ON	99	ON	ON	OFF	OFF	OFF	ON	ON
36	OFF	ON	OFF	OFF	ON	OFF	OFF	100	ON	ON	OFF	OFF	ON	OFF	OFF
37	OFF	ON	OFF	OFF	ON	OFF	ON	101	ON	ON	OFF	OFF	ON	OFF	ON
38	OFF	ON	OFF	OFF	ON	ON	OFF	102	ON	ON	OFF	OFF	ON	ON	OFF
39	OFF	ON	OFF	OFF	ON	ON	ON	103	ON	ON	OFF	OFF	ON	ON	ON
40	OFF	ON	OFF	ON	OFF	OFF	OFF	104	ON	ON	OFF	ON	OFF	OFF	OFF
41	OFF	ON	OFF	ON	OFF	OFF	ON	105	ON	ON	OFF	ON	OFF	OFF	ON
42	OFF	ON	OFF	ON	OFF	ON	OFF	106	ON	ON	OFF	ON	OFF	ON	OFF
43	OFF	ON	OFF	ON	OFF	ON	ON	107	ON	ON	OFF	ON	OFF	ON	ON
44	OFF	ON	OFF	ON	ON	OFF	OFF	108	ON	ON	OFF	ON	ON	OFF	OFF
45	OFF	ON	OFF	ON	ON	OFF	ON	109	ON	ON	OFF	ON	ON	OFF	ON
46	OFF	ON	OFF	ON	ON	ON	OFF	110	ON	ON	OFF	ON	ON	ON	OFF
47	OFF	ON	OFF	ON	ON	ON	ON	111	ON	ON	OFF	ON	ON	ON	ON
48	OFF	ON	ON	OFF	OFF	OFF	OFF	112	ON	ON	ON	OFF	OFF	OFF	OFF
49	OFF	ON	ON	OFF	OFF	OFF	ON	113	ON	ON	ON	OFF	OFF	OFF	ON
50	OFF	ON	ON	OFF	OFF	ON	OFF	114	ON	ON	ON	OFF	OFF	ON	OFF
51	OFF	ON	ON	OFF	OFF	ON	ON	115	ON	ON	ON	OFF	OFF	ON	ON
52	OFF	ON	ON	OFF	ON	OFF	OFF	116	ON	ON	ON	OFF	ON	OFF	OFF
53	OFF	ON	ON	OFF	ON	OFF	ON	117	ON	ON	ON	OFF	ON	OFF	ON
54	OFF	ON	ON	OFF	ON	ON	OFF	118	ON	ON	ON	OFF	ON	ON	OFF
55	OFF	ON	ON	OFF	ON	ON	ON	119	ON	ON	ON	OFF	ON	ON	ON
56	OFF	ON	ON	ON	OFF	OFF	OFF	120	ON	ON	ON	ON	OFF	OFF	OFF
57	OFF	ON	ON	ON	OFF	OFF	ON	121	ON	ON	ON	ON	OFF	OFF	ON
58	OFF	ON	ON	ON	OFF	ON	OFF	122	ON	ON	ON	ON	OFF	ON	OFF
59	OFF	ON	ON	ON	OFF	ON	ON	123	ON	ON	ON	ON	OFF	ON	ON
60	OFF	ON	ON	ON	ON	OFF	OFF	124	ON	ON	ON	ON	ON	OFF	OFF
61	OFF	ON	ON	ON	ON	OFF	ON	125	ON	ON	ON	ON	ON	OFF	ON
62	OFF	ON	ON	ON	ON	ON	OFF	126	ON	ON	ON	ON	ON	ON	OFF
63	OFF	ON	ON	ON	ON	ON	ON	127	ON	ON	ON	ON	ON	ON	ON

A.1 Factory and user dip-switch setting

In the following table the factory dip-switch settings are listed.

*See **section 3.5.2** for **dip-switch setting guidelines.***

FACTORY SETTING											
DIP1								DIP2			
D1	D2	D3	D4	D5	D6	D7	D8	D1	D2	D3	D4
off	off	off	off	off	off	off	off	off	off	off	off

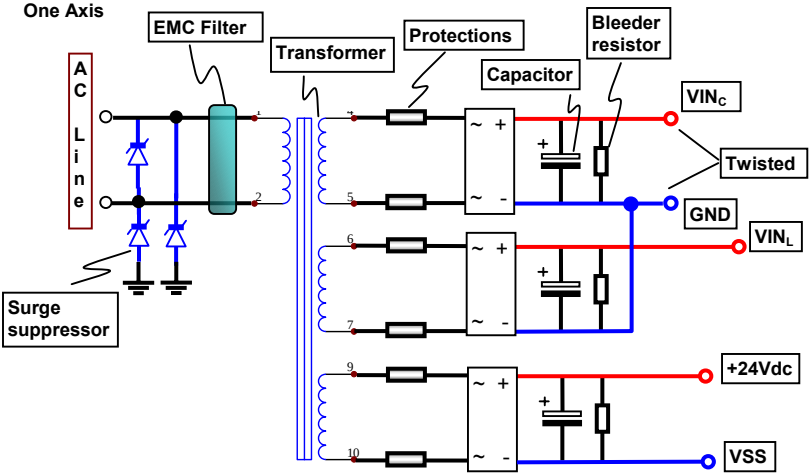
USER SETTINGS												
	DIP1								DIP2			
	D1	D2	D3	D4	D5	D6	D7	D8	D1	D2	D3	D4

USER CONNECTIONS								
SDMWD170		Working Mode						
Connector		C0300	C0400					
CN1	1	Not available	Not available					
	2	CAN_L signal	RS232 Rx					
	3	CAN Ground	RS232 Tx					
	4	Not available	Not available					
	5	Not available	RS232 Ground					
	6	Not available	RS485 +RX					
	7	CAN_H signal	RS485 +TX					
	8	Not available	RS485 -RX					
	9	Not available	RS485 -TX					
CN2	1	+5Vdc						
	2	AGND						
	3	+IN_AN0						
	4	-IN_AN0						
CN3	1	+B0_IN0						
	2	-B0_IN0						
	3	+B0_IN1						
	4	-B0_IN1						
	5	+B0_IN2						
	6	-B0_IN2						
	7	+B0_IN3						
	8	-B0_IN3						
	9	COM_IN						
CN4	1	VSS						
	2	B0_OUT0						
	3	VSS						
	4	B0_OUT1						
	5	VSS						
	6	B0_OUT2						
	7	VSS						
	8	B0_OUT3						
	9	VSS						
	10	+24Vdc						
CN5	1	VIN_C						
	2	VIN_L						
	3	EG						
	4	GND						
CN6	1	B*						
	2	B						
	3	MEG						
	4	A*						
	5	A						

A.2 Power Supply

Connection Diagrams

One Axis



Drive Power Supply: converter

Surge Suppressors on primary circuit to protects the drive against line surge spikes.

Transformer Be sure that the transformer primary voltage can withstand the power line peak voltage. The secondary bus peak voltage is approximately equal to 1.41 * Actual secondary rms voltage.

The DC supply voltage must never exceed the Vdc rating of your unit version.

Transformer VA ratings depend on motor power ratings: defining the trasformer the user can make reference to support@everelettronica.it service for the motion control system parts definition (motor and power supply sizing). The following procedure can also be used to make an approximated extimation of the power supply features:

1. Power at each axis shaft (watts)=π*N*T/30 where N=[RPM], T=[Nm];
2. Total_power (watts) = summ of simultaneously moving axes power;
3. Transformer_power (watts) = 2 * total_power (efficiency = 0.5)
4. Transformer_power (VA)= Transformer_power [watts] divided by 0,7 (single phase ac) or 0,8 (three phases ac);
5. To define the transformer losses assume an 8% Load Regulation (the secondary voltage can exceed the rated value of 8% when the load current is reduced from maximum to zero);

An easy and fast solution allows to calculate Transformer VA ratings: as Power(VA) = $\sqrt{2}$* Vdc_{BUS}* $Imax_{PHASE}$

Power rectifier:
Bridge assume a 15 Arms as worst case rectifier current rating.

Capacitor 6600uF capacitor (85°C) is needed at maximum drive current. The capacitor's working voltage rating must widsthand the maximum dc bus voltage with a safety margin.
An additional capacitor is needed when DC bus cable is longer than 1mt.

An EMC Filter is generally necessary to meet the requirements of the EMC emissions regulating standards. A filter is recommended when a sensitive circuit is powered by the drive ac line.

Looking for a commerc line filter consider the total continuous RMS lcurrent of the motion control system..

The supply line filter should be inserted between the ac mains and the transformer if this is near the drive or in the same cabinet, between the transformer and the rectifier bridge in the other cases, keeping the rectifier bridge as close to the drive as possible and the connection between the filter and the transformer as short as possible.

Refer to the filter manufacturer installing instructions for an efffective reduction most of conducted emissions.

Protections use 16A rated fuses on AC bus or a safety switch.

Drive Power Supply: logic

Surge Suppressors on primary circuit to protects the drive against line surge spikes.

Transformer Be sure that the transformer primary voltage can withstand the power line peak voltage. The secondary bus peak voltage is approximately equal to 1.41 * Actual secondary rms voltage.

The DC supply voltage must never exceed the Vdc rating of your unit version.

Logic Transformer VA ratings is 25VA.

Power rectifier:
Bridge assume a 4 Arms as worst case rectifier current rating.

Capacitor 470uF capacitor (85°C) is needed. The capacitor's working voltage rating must widsthand the maximum dc bus voltage with a safety margin.

Protections use 1A rated fuses on AC bus or a safety switch.

Dirver Power Supply: input/output

Surge Suppressors on primary circuit to protects the drive against line surge spikes.

Transformer Be sure that the transformer primary voltage can withstand the power line peak voltage. The secondary bus peak voltage is approximately equal to 1.41 * Actual secondary rms voltage.

The DC supply voltage must never exceed the Vdc rating of your unit version.

Logic Transformer VA ratings is 85VA.

Power rectifier: Bridge assume a 6 Arms as worst case rectifier current rating.

Capacitor 3000uF capacitor (85°C) is needed. The capacitor's working voltage rating must widsthand the maximum dc bus voltage with a safety margin.

Protections use 5A rated fuses on AC bus or a safety switch.